

Policy brief

Strawberries with fraudulent country-of-origin information can now be revealed

Can the ratios of stable isotopes help food authorities?

Can stable isotopes reveal the country of origin of strawberries?

Project: The Alkuperältään aidot – [Genuine in their origin] project: a new tool for determining the country of origin of plant products and confirming fraudulent country-of-origin

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Fraudulent country-of-origin labelling is common. The Alkuperältään aidot (Genuine in their origin) project developed a new tool for food control that can be used to determine whether garden strawberries originate from Finland.

- During the project, a database on the ratios of the stable, non-radioactive isotopes of certain light elements in domestic strawberries was created. The database is now being used by authorities.
- As a result of the project, food control authorities now have an analysis method at their disposal that allows them to examine whether a strawberry that is being sold as domestic is actually foreign. The results serve as additional evidence in food control. Food control helps maintain the price of domestic strawberries at the level set by production costs. This ensures the profitability and competitiveness of strawberry farming.
- Consumers, shops and food processors are able to trust the domestic labelling of berries.

Stable, non-radioactive isotopes in country-of-origin analyses

Elements can have differing non-radioactive forms – stable isotopes – if the nuclei of their atoms have an exceptional number of neutrons. With the help of advanced analysers, it is possible to measure the number of these different isotopes and determine their ratios in plants.

The ratios of isotopes are especially affected by local water conditions and terrain. When the area-specific and typical ratios of isotopes in plants or other natural resources are known, they can be used to confirm the country of origin of products such as strawberries with statistical modelling methods.

Keywords: genuineness, element analysis, authenticity, food control, garden strawberry, stable isotope analysis

Doubts on the real country of origin are common especially with early season strawberries

Counterfeit foods are estimated to cause a loss of 8 to 12 billion euros annually in the EU

Suspicious of misinformation as the starting point

Counterfeiting the country of origin of food is a widely occurring issue in Europe, including Finland. Especially at the beginning of the harvest season, foreign strawberries are occasionally suspected to be sold as Finnish strawberries. Strawberries are one of the foods that are most often suspected to be counterfeit in many countries.

Consumers must be able to trust the country-of-origin labelling to be able to make informed buying decisions. It is also important to be sure of the origin of raw materials on the food industry that processes plant products. Even one suspicious batch of raw materials can ruin the entire company's reputation.

Garden strawberry is an important crop in Finland: one in three horticultural farms produces strawberry. Strawberries entering the market with fraudulent country-of-origin labelling can cause considerable pressure to reduce the prices of domestic berries unfairly, reducing the profitability of our berry production. There has been a need for a reliable tool to determine the country of origin of strawberries for long.



Material

Berry samples were collected from every 14th strawberry farm throughout the production area

The use of stable isotopes for determining the country of origin requires that their ratios in the region under investigation are known. To gather a reference database, researchers collected strawberry samples widely from our entire production area: at least one sample from each 50 km x 50 km regional screen. The sample covered 7% of our commercial strawberry plantations. The stable isotopes of hydrogen, oxygen, carbon, sulphur and nitrogen were analysed in the strawberries.

**Finnish strawberries
stand out from
foreign berries**

Discovering the fingerprints of the Finnish garden strawberry

- The project compiled a comprehensive reference database on the ratios of stable isotopes in Finnish strawberries. Based on its piloting, food control authorities can utilise it to determine whether a strawberry is of Finnish origin or not.
- Based on the analyses, the Finnish samples can be clearly categorised into a separate group, setting them apart from e.g. strawberries in neighbouring countries or large European producer countries.
- The ratio of hydrogen isotopes in the berries reflects local water conditions and can thus be considered an important 'fingerprint' of the origin of our garden strawberry.
- The Alkuperältään aidot project also studied the use of the levels of elements in strawberries as a reference database. Presumably levels of elements can also be used to verify the origin of berries either on their own or together with isotope results although this should be confirmed with further studies.



While the project is over, work continues

**Analyses are
performed in
specialised
laboratories**

- Determining stable isotopes requires special equipment and trained laboratory personnel. It is possible to perform the analysis in commercial laboratories although the Finnish Food Authority aims to start determining the most important isotopes with new analysis instruments.
- Some strawberry samples should be selected from every harvest season to annually compare the results of the analysis with the values of the reference database. Reliable collection of samples can be arranged in connection with other control activities of primary production.
- It is important that the possibility of using the new isotope tool for

Strawberry fingerprints should be used to discover counterfeit origin

**Food control
authorities can utilise
the new analysis
method**

The reference database of stable isotopes should be utilised if there is a suspicion of misinformation in the country of origin of strawberries.

- The introduction of the method in the Finnish Food Authority's laboratory lowers the threshold for analyses in Finland.
- Operators in the berry market chains as well as consumers should be reminded that it is possible to determine the origin of strawberries.
- It is worth utilising the analysis of stable isotopes and the collection of reference databases with other products that are susceptible to counterfeit origin, such as berries growing in the nature.

Read more about the project and its results:

Karhu S., Rantanen M., Hellstén J., Welling A., Nieminen J., Rokka M., Venäläinen E.-R., Jokinen S., Järvinen J., Mykkänen S. & Villberg A. 2020. Alkuperältään aidot – koordinoitulla yhteistyöllä uusi työkalu kasvituotteiden alkuperän määrittämiseen ja alkuperäväärennösten osoittamiseen. Final report. 21 p. Natural Resources Institute Finland, Finnish Food Authority.

